Evoked activity patterns during left-hand finger presses in right S1 of 3 exemplary participants.

The black line indicates the fundus of the central sulcus, while the white dashed lines show the boundaries between Brodmann areas (see inset) are estimated using a probabilistic surface-based cytoarchitectonic atlas (Fischl, B., et al. (2008) Cereb Cortex 18, 1973-1980).
Supplementary Figure 2

Individual anatomical and functional maps after spherical inter-subject normalisation driven solely by anatomical criteria

A ~5x5 cm area around the hand knob is shown. The left hemispheres are flipped, such that posterior regions are to the left and anterior regions to the right. (a) Sulcal depth maps with sulci shown in dark and gyri in light shades. (b) Pattern distance averaged across all 10 possible digit pairs for the contralateral hand, estimated using a cortical searchlight analysis (Oosterhof, N.N. et al. (2011) Neuroimage 56, 593-600), indicates the location of the functional hand area in M1 and S1.
Supplementary Figure 3

*Distance between activation patterns in somatosensory cortex*

(a) Cross-validated Mahalanobis distance between patterns for all digits in right S1 for the three participants depicted in Figure 1. (b) Distances between activity patterns for digit 1-5 averaged over the 12 hemispheres. (c) Multi-dimensional scaling of the pattern distances in two-dimensional space. Ellipses show standard error of the mean after procrustes alignment across hemispheres. There were significant differences between distance structures in M1 and S1: After normalising the distances in each ROI by the mean distance, the distances 2-3, 2-4, and 3-4 were larger in S1 than in M1, while the distance 1-5 was larger in M1 than in S1 (all $t_{11} > 3.7$, $p<0.02$ after Bonferroni-correction for multiple tests).
Supplementary Figure 4

Finger representation as revealed by high-resolution fMRI at 7T

(a) Evoked activity patterns during single finger movements of the right hand in the left primary motor cortex of one individual. The dotted line indicates the fundus of the central sulcus. (b) Multi-dimensional scaling of the pattern distances in S1 (c) and M1.
Supplementary Figure 5

Distance structures for hand usage estimated from two independent studies

In the Thomik and Faisal study, 8 right-handed participants performed everyday tasks. Joint kinematics data was recorded simultaneously for both hands and the distance structure for each hand was estimated in exactly the same way as reported previously for the Ingram et al. 2008 study.